Appendix A

Letter from David Webb Wisconsin Department of Natural Resources, August 3, 1998

CORRESPONDENCE/MEMORANDUM — **State of Wisconsin**

DATE: August 3, 1998 FILE REF: 3200

TO: Bruce Baker - AD/5

FROM: Ed Lynch - RR/3 EXL
David Webb - WT/2 DW

SUBJECT: Screening for Chemicals of Concern for the Fox River Risk Assessment

SUMMARY

The Screening Level Risk Assessment (SLRA) for the Fox River was completed by RETEC and delivered to the Department on June 16, 1998. One of its primary purposes was to use as a starting point the "universe" of chemicals and identify (screen) chemicals from which existing risk to the ecosystem and human health would be quantified in the Baseline Risk Assessment. Not all chemicals are important to consider for the Baseline Risk Assessment. Ideally, the Baseline Risk Assessment should focus on chemicals which are most likely to contribute significantly to risks calculated for exposure scenarios involving that medium, so that the risk assessment is focused on the "most significant" chemicals (U.S. EPA; Risk Assessment Guidance for Superfund Volume 1; Publ. No. EPA/540/1-89/002). The SLRA provides a scientific process for eliminating chemicals from consideration when quantifying risk of injury or toxicity to the ecosystem and humans.

PCBs are a known source of risk to humans who consume Fox River fish and are the primary contributor to overall risk in the Fox River system. It was important for the SLRA to provide a means by which other chemicals could be screened to quantify overall risk to the system (to determine whether any other chemicals needed to be advanced to the Baseline Risk Assessment in addition to PCBs). Chemicals to be Advanced to the Baseline Risk Assessment include the following:

PCBs (Total and/or Aroclor 1242)
2,3,7,8-TCDD (Dioxin)
2,3,7,8-TCDF (Furan)
DDT/DDE/DDD
Dieldrin
Arsenic
Lead
Mercury

DISCUSSION

The Screening Level Risk Assessment was designed to screen risk and chemicals based upon both ecosystem and human-health effects. Screening for chemicals to be considered in the Baseline Risk Assessment, and further in the Remedial Investigation (RI) and Feasibility Study (FS) was to involve a 4-tiered approach. The following is a summary of the layers of screening - narrowing the list of chemicals as the tiers are executed:

Tier 1: Include all chemicals which have been detected in the system.
Tier 2: Compare detected chemicals against background levels - include those which exceed background levels.
Tier 3: Compare chemicals from tier 2 against applicable"toxicology based" values (water quality standards, sediment benchmarks, etc.)
Tier 4: Ascertain whether chemicals resulting from tier 3 co-occur with PCBs. If a particular chemical significantly co-occurs with PCBs, it would be excluded.

There is a massive amount of data from which to complete the screening tiers. Because of difficulties in distilling all of the data to a usable format, and also a need to adhere to deadlines for completing tasks, tiers 2 and 4 were not fully completed. It is unlikely that executing tier 2 (comparing against background) would have resulted in screening out many chemicals, since the relationship between chemical levels and "background" is often unclear. It is unlikely that formal comparisons will be made to background levels for the purposes of removing chemicals from consideration.

Executing tier 4 (co-occurrence with PCBs) likely would have resulted in many chemicals being eliminated from consideration since many of the chemicals in the Fox River system are located in similar areas (depositional areas of soft-sediment). As available information allows, efforts to ascertain whether particular chemicals co-occur with PCBs will occur and there is a high probability that many chemicals would co-occur with PCBs to a significant extent. At that time, such a chemical would be removed from the list of chemicals considered in the Baseline Risk Assessment.

The tally of all chemicals which were identified in the SLRA (those that did not get screened-out) is approximately 75 chemicals (treating Polycyclic Aromatic Hydrocarbons - PAHs as one chemical). For the purposes of the SLRA, the Fox River was segmented into five areas of interest (Green Bay, between DePere and Green Bay, between Wrightstown and DePere, between Appleton and Wrightstown, and between Little Lake Butte des Morts and Wrightstown). For each area of interest, chemicals were screened in various environmental media (water, sediment, tissue, etc.). An important consideration for whether a chemical will significantly contribute to toxicity and/or risk to the ecosystem and human health is the spatial extent of a chemical's impact. It is important to account for whether a particular chemical is eliciting system-wide impacts, or whether it was retained through the screening process due to its detection in one media in one area of interest. The final list of chemicals (PCBs, 2,3,7,8-TCDD, 2,3,7,8-TCDF, DDT/DDE/DDD, Dieldrin, Arsenic, Lead, and Mercury) is inclusive of chemicals identified in both screens (ecosystem and human health).

In addition to the system-wide nature of a chemical's impact, it is helpful to make a qualitative determination of how a chemical was retained through the screening process relative to other chemicals (PCBs). The approaches to quantify potential risk in the ecological and human-health screens use metrics referred to as the Hazard Quotient (HQ) and the Relative Risk Ratio (RRR), respectively. The HQ is derived by taking the ratio of the maximum detected concentration of the chemical in a particular media to its applicable corresponding media-specific toxicologically based value (e.g., a water quality standard, a sediment benchmark, etc.). Generating RRRs for human health is more complex than ecological due to cancer and non-cancer effects, and the complexity of working with human health toxocological data. HQs and RRRs are conceptually similar, but not identical in their derivation or interpretation. In either case, as the magnitude of the HQ or RRR increases, the potential for a particular chemical to exert an adverse effect to the ecosystem or to human health increases. In order to put some of the chemicals into perspective, it is useful to compare the HQ or RRR of a particular chemical to the HQ and RRR for PCBs. The HQs and RRRs for the other chemicals (based upon either the human health screen or the ecosystem screen) are the following:

	Highest HQ or RRR
PCBs (RRR)	1,300,000
PCBs (HQ)	5,900
2,3,7,8-TCDD (RRR)	9,800,000
2,3,7,8-TCDF (RRR)	1,800,000
Dieldrin (RRR)	12,903
DDT (RRR)	4,500
Arsenic (RRR)	2,200
Mercury (RRR)	220

Of the metals analyzed in sediment and tissue samples from the Lower Fox River and Green Bay system, only arsenic, lead, and mercury were retained for the Baseline Risk Assessment. The most critical exposure pathway from the perspective of human health effects is ingestion of fish. Arsenic, cadmium, chromium, copper, lead, mercury, selenium, and zinc were analyzed in fish tissue and all but arsenic and mercury were at levels that did not warrant advancement to the Baseline Risk Assessment. Thus, arsenic and mercury were retained for the Baseline Risk Assessment. Lead was found in fish tissue but was not evaluated in the Screening Level Risk Assessment because appropriate toxicological thresholds were not readily available. Thus, lead was retained for a more detailed evaluation in the Baseline Risk Assessment.

The attachment to this memo identifies the rationale for the selection of each of the chemicals of concern being advanced to the Baseline Risk Assessment. In addition, it provides comments on a few additional chemicals.

Please contact David Webb if you have questions.

Approved:

Bruce Baker, Deputy Administrator
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ATTACHMENT

For each chemical considered, there were different factors which caused a chemical to be retained or discarded from consideration. The following is a synopsis of the factors which caused a particular chemical (or class of chemical) to be retained for consideration in the Baseline Risk Assessment; additionally, a brief discussion follows for chemicals (or classes of chemicals) which are notably absent:

PCBs (Total and/or Aroclor 1242):
Fish consumption advisories are wide-spread.
The range of RRRs (based upon human health) is 172,000 to 1,261,314.
The prevelance and impact of PCBs in the Fox River system is widespread.

2,3,7,8-TCDD (Dioxin):
The range of RRRs (based upon human health) is large and as high as 9,766,082 (lack of complete data preclude comparison using all river areas and exposure pathways).
The prevelance and potential impact to the ecosystem and human health of 2,3,7,8-TCDD is widespread in the Fox River system.

2,3,7,8-TCDF (Furan):
The range of RRRs (based upon human health) is large and as high as 1,752,895 (lack of complete data preclude comparison using all river areas and exposure pathways).
The prevelance and potential impact to the ecosystem and human health of 2,3,7,8-TCDD is widespread in the Fox River system.

DDT/DDE/DDD:
The range of RRRs (based upon human health) is 43 to 4,528. In addition, the potential for ecological impacts, especially to avian populations, is significant.

Dieldrin:
The range of RRRs (based upon human health) is 323 to 12,903 (lack of complete data preclude comparison using all river areas and exposure pathways).

Arsenic:
Human health RRRs for arsenic were as high as 2,200. Also, arsenic was found in fish at levels which exceed appropriate cancer risk (10^{-4}) used in a screening context.

Lead:
Ecological HQ's were as high as 41. Human health risk were not evaluated thoroughly because screening levels were not readily available.

Mercury:
The range of HQs (based upon human health) is 48 to 220. Mercury impacts on human health and ecosystem integrity are relatively well known and in its methylated form, mercury is highly bioaccumulative.

Other chemicals which may be considered in the other risk assessment efforts include the following:

Copper:
Copper was detected at significant concentrations in game fish - up to 3,400 ug/kg in the area downstream of DePere. HQ's for copper are not elevated enough relative to other compounds, it is not widespread, and not bioaccumulative (relatively).

Zinc:
Zinc was detected at significant concentrations in game fish - up to 13,000 ug/kg in the area downstream of DePere. However, the RRR associated with ingestion of this fish was below one. Ecologically based HQs for zinc are not elevated enough relative to other compounds, it is not widespread, and not bioaccumulative (relatively).

Polycyclic Aromatic Hydrocarbons (PAHs):
Risks due to PAHs are difficult to quantify since many PAHs are efficiently metabolized. System-wide impacts are unlikely to occur, and while bioaccumulation can be an exposure pathway, reliable data is not available and in some cases not accurate due to metabolism.

Note: The concepts of HQs and RRRs are used here for presentation purposes and have been simplified for brevity and comparative purposes. For a more complete and thorough discussion/presentation of the details, the Screening Level Human Health and Ecological Risk Assessment - Lower Fox River Site, Wisconsin, June 15, 1998 should be consulted.